UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/059,292	01/31/2002	Jerome Maillot	1252.1053	7151

21171 7590 01/18/2006

STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
NGUYEN, KIMBINH T	
ART UNIT	**PAPER NUMBER**
2671	

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/059,292	MAILLOT ET AL.	
	Examiner	Art Unit	
	Kimbinh T. Nguyen	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *24* is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to amendment filed 08/04/04.

2. Claims 1-24 are pending in the application.

Claim Objections

3. Claim 19 is objected to because of the following informalities: misspelling: the last line of claim 19: "distribution". Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-12 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamurthy (6,256,038) in view of Pharr et al. "Geometry Caching for Ray-Tracing Displacement Maps".

Claim 1, Krishnamurthy discloses sampling the surface at a given rate or resolution with generated sample points (spring sample points; col. 16, lines 1-13): determining automatically sample points (an automated resampling of the polygon patch; col. 9, lines 29-30) that add detail to the surface when displaced by a displacement map (col. 20, lines 59-62; col. 27, line 65), the map being applicable to points of any arbitrary surface, by using a local criteria calculated based on

displacements of neighboring sample points by the displacement map (col. 45, lines 7-13); and increasing automatically a resolution of the surface of the model by keeping the determined sample points and discarding other sample points. Krishnamurthy teaches increasing automatically a resolution of the surface but does not teach keeping the determined sample points and discarding other sample points; however, Pharr et al teaches: adding detail to surface geometry in rendering system (see abstract, page 1); the caches keeps a fixed number of displaced triangles in memory, and discards geometry that has not been recently referenced when the caches fills up (see section 1, page 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate geometry caching for ray tracing displacement map taught by Pharr into parametric surface approximation of Krishnamurthy for rendering displacement mapped geometry, because using of a geometry cache in order to handle the large amounts of geometry created by displacement mapping, it would have efficiently rendered highly complex scenes while using a limited amount of memory (see abstract).

Claim 2, Krishnamurthy discloses moving determined sample points to increase detail represented thereby (col. 20, lines 54-59).

Claim 3, Krishnamurthy discloses the moved sample points are moved toward a feature of the displacement map (col. 21, lines 34-37; col. 23, lines 26-27).

Claim 4, Krishnamurthy discloses the local criteria comprises a feature metric measuring a local feature within a locality of the sample points displaced by the displacement map (col. 22, line 1 through col. 23, line 54).

Claim 5, Krishnamurthy discloses moving a determined toward a direction of a high rate of change according to the displacement map (col. 23, lines 26-34).

Claim 6, Krishnamurthy discloses determining that sample points are points of significant curvature (spring sample points, col. 32, lines 38-54).

Claim 7, Krishnamurthy discloses preferentially connecting vertices of polygons of the surface along one of edges and borders of a sampled area of the surface (fig. 16).

Claim 8, Krishnamurthy discloses the polygons are triangles and wherein vertices of the triangles are feature points (col. 8, lines 16-35, col. 46, lines 40-51).

Claim 9, Krishnamurthy discloses the model is a polygon mesh model (col. 46, lines 40-51).

Claim 10, the rationale provided in the rejection of claims 1 and 5 are incorporated herein. In addition Krishnamurthy either moving or discarding sample points according to the location or direction of the local feature, the map being applicable to points of any arbitrary surface (col. 45, lines 10-13, col. 46, lines 3-39).

Claim 11, the rationale provided in the rejection of claim 1 is incorporated herein. In addition, Krishnamurthy discloses uniformly sampling the model at a given rate or resolution (resampling); identifying automatically areas of details or features of sample points (a feature curve) of the sampled model as displaced by a displacement map, the map being applicable to points of any arbitrary surface (col. 44, line 56 through col. 46, line 39); increasing resolution of the sampled model by discarding some sample points

according to the areas of details or features (col. 9, lines 48-50) and moving other sample points according to the areas of details or features (col. 9, lines 59-67).

Claim 12, the rationale provided in the rejection of claim 1 is incorporated herein. In addition, Krishnamurthy discloses automatically deriving local feature criteria of the sampled surface according to a displacement map thereof and using the local feature criteria to automatically determine which sampled points of the surface (B-spline surfaces) to keep for displacement by the displacement map and only keeping the so-determine sample points for displacement by the displacement map, the map being applicable to points of any arbitrary surface (col. 44, line 43 through col. 45, line 13).

Claims 14 and 15, the rationale provide in the rejection of claim 1 is incorporated herein. In addition, Krishnamurthy discloses approximating a surface with sample points sampling the surface at a given resolution (surface approximation, col. 3, lines 40-52); using a displacement function to compute a height of sample point in a local neighborhood (col. 46, lines 2-52), the function being applicable to points of any arbitrary surface (col. 45, lines 11-13); deriving feature criteria for the sample points using local change in the height; representing the surface with the sample point when the feature criteria indicates that the local neighborhood is not substantially flat; representing the surface without the point when the feature criteria indicates that the local neighborhood is substantially flat (curvature/flatness/relaxation is independent of the height point: a displacement map that is not a height field; col. 46, lines 2-65).

Claim 16, Krishnamurthy repositioning the point to a location in the direction of the gradient (we move the spring points to a new locations in the desired direction, col. 21, lines 36-39; col. 23, lines 26-30).

Claim 17, Krishnamurthy discloses adding a new point in the neighborhood at an extrema (into the cavity, the arc length criteria) in the local neighborhood in the direction of the gradient (col. 20, lines 60-63; col. 21, line 44 through col. 22, line 24; col. 23, lines 26-34).

6. Claims 13, 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Musgrave "Grid Tracing: Fast Ray Tracing for Height Fields" in view of Krishnamurthy (6,256,038)

Claim 13, Musgrave discloses generating 2D height maps for a subdivision surface by sampling a height field at a given resolution to calculate height values for points in the subdivision (a hierarchical decomposition of the height field into successively smaller squares), the height field being applicable to points of any arbitrary surface; generating 2D feature maps, for the subdivisions, that identify features of the height field, by using the height map and height field to calculate approximate degrees and directions of local curvature (see sections 1-3). Musgrave does not teach the height field being applicable to points of any arbitrary surface; however, Krishnamurthy teaches this feature (col. 46, lines 9-39), and Krishnamurthy also teaches global U and U direction (vector displacement map; col. 18, line 50 through col. 19, line 13; fig. 2A; col. 46, lines 9-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a scalar displacement maps taught by

Krishnamurthy into fast ray tracing height field of Musgrave, because it would allow users to easily create the customized parameterizations required by many applications (col. 4, lines 13-14).

Claims 19-23, the rationale provided in the rejection of claims 13-15 are incorporated herein. In addition, Musgrave discloses deriving points for triangles in a tessellation of the surface, by sampling the surface at a given rate or resolution to create a distribution of sample points in triangle (see section 1), calculating height values for sample points in the distribution by sampling a height field, calculating feature metrics for respective sample points in the distribution by approximating second derivatives of the points using height values of neighboring points in the distribution, refining the distribution of sample points by eliminating sample points from the distribution that have feature metrics indicating a respective locally flattish region of the height field, and by keeping non-eliminated sample points in the distribution (sections 1-6).

7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamurthy (6,256,038)

Claim 18, Krishnamurthy discloses identifying features in local neighborhoods of points in a range, the range resulting from a displacement map applied to a domain comprising sample points of a given resolution or rate approximating the surface, the features comprising locations or directions of detail in the range of the displacement map (col. 21, lines 34-67), the map being applicable to points of any arbitrary surface (col. 45, lines 11-13); adjusting points in the range, or corresponding points in the

domain according to the locations or directions of the features (to move a spring mesh point in the desired direction; col. 23, lines 25-54); identifying borders of features in the range of the displacement map; making a displaced surface mesh by using borders to constrain a triangulation of the adjusted points (displacement function relates points on the fitted spline surface to points on triangles of the original polygon mesh; col. 46, line through col. 48, line 30, figs. 15-17). Krishnamurthy does not teach clearly a triangulation of the adjusted points; however, Krishnamurthy teaches subdivision for sampling surface criteria which also relates to a triangular of points; therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the triangulation of the points, because it would provide a surface resolution at the finest level (col. 26, lines 14-15).

Allowable Subject Matter

8. Claim 24 is allowed.

Response to Arguments

9. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimbinh T. Nguyen whose telephone number is (571) 272-7644. The examiner can normally be reached on Monday to Thursday from 7:00 AM to 4:30 PM. The examiner can also be reached on alternate Friday from 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached at (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

January 13, 2006

KIMBINH T. NGUYEN
PRIMARY EXAMINER